PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

PLANTERS' BULLETIN FIFTY-FOUR

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RRI

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CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special enquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 72051. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and advice of despatch should be given by letter or telegram.

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ADVICE. Enquiries are invited from rubber producers in the Federation of Malaya, Singapore, Nigeria, the colony of North Borneo, and the territories of Sarawak and Brunei, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of our clone indentification inspectors. INTERVIEWS should be arranged by letter, as members of the senior research and advisory staff are frequently absent on visits to plantations.

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PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur May 1961 Number 54

Editorial: Planters' Conference

A year ago our editorial subject was the Natural Rubber Research Conference and we revert to the subject of conferences in this issue, the interest now being in a Planters' Conference. A previous conference, with the same title, held in Kuala Lumpur in 1938 was intended as the first of a series. This was so successful that we have been encouraged to restart the programme interrupted by the last war.

Arrangements are being made by the Estates Advisory Service for the Conference to take place in July of this year.

Many present day conferences are international in scope, attended by scientists and specialists of world repute with the inevitable exclusion of the practical man who derives his livelihood from the application of the results and deliberations of the research worker. The result is that the research worker does not have sufficient opportunity for discussing his work with the practical man who applies his results. We do not suggest that international scientific conferences should become unwieldy by opening their doors to anyone with an interest in the subjects under discussion. Nevertheless, the man with practical experience of field application had a wealth of information that is of prime importance in developing many research projects. This is well appreciated by research workers because the final completion of a project depends upon its successful implementation in the field, which is where the field man makes his judgement and his decision.

We at the Rubber Research Institute are fully aware of the need to acquire knowledge of the outcome of applied research on plantations and sometimes wonder whether reticence on the part of the successful practical planter arises from his feeling that his ideas and experiences are not worth bringing to our attention. We would hasten to reassure him that this is far from the case and that many fruitful discussions have resulted from this source. The pooling of experience of field results can, besides helping to stimulate the progress of research, be of inestimable value to others in the same line of business.

How we are to tap this source of information is another problem and it is for this purpose that the Rubber Research Institute has planned a Planters' Conference in 1961. The purpose of the conference is to give rubber planters the opportunity of presenting their views and experiences at what might be called ground level, so that there can be full discussion on the observations and ideas which arise under day to day estate conditions.

An interim announcement of the 1961 Planters' Conference has already been made in *Planters' Bulletin 53,* and 'Tapping and Yield Stimulation' has been chosen as the title for the first conference. It is hoped that all aspects of this very important subject will be covered, and the success of the conference will depend on the support it receives from planters. It is intended that the majority of papers will be by planters on their own practical experiences and that those who feel they cannot do this, will contribute to the general discussions following the papers.

Remember, this is a Planters' Conference, a frank and open expression of views and experiences is what is wanted and 'no holds barred'.

Root Disease Control

WE ARE RETURNING TO this most important topic to state the principles of root disease control, to advance our recommendations concerning control measures where additional knowledge has been obtained since the article on root disease and replanting was written for *Planters' Bulletin 35,* and to include an account of methods for limiting the spread of root disease in mature rubber. Here we shall draw some distinctions between *Fomes lignosus* and the other two major root diseases of rubber in Malaya — *Ganoderma pseudoferreum* and *Fomes noxius.* Hitherto the three have been treated as a single disease complex, their recognition then being a matter of little importance as the treatment was in all cases the same. In several respects it is a refinement in control methods to identify the diseases, which may call for different treatments; we are thus adding some notes as an aid to recognition. A fuller description of root disease was given in the article in *Planters' Bulletin 10.*

In the early stages of attack it is easy to distinguish the three major root diseases by the external appearance of the diseased roots. *F. lignosus* forms whitish root-like strands (rhizomorphs) which may become yellow with age or even take on a dull reddish-brown tinge in some soils. The leading edge of the advancing mycelium of both *F. noxius* and *G. pseudoferreum* is creamy white. A root infected with *F. noxius,* however, becomes covered by an incrustation of soil cemented by the fungus; amongst it can be seen specks of velvety brown mycelium. *G. pseudoferreum* also covers the root with a continuous fungal skin, which is clear red when young; when old it becomes almost black, but the red colour is discernible if the root is washed or wetted.

At first, wood invaded by all three fungi has the same appearance; it remains moist but is discoloured brown. In the later stages, however, the three diseases can readily be distinguished by the nature of the rot produced. Wood infected with *F. noxius* contains brown lines which

develop into a hard, impermeable, honey-comb; the rot is dry. The rot produced by *G. pseudoferreum* is pale and may be wet or dry depending on soil conditions; the wood tends to break into annular fragments. The rot of *F. lignosus,* which may also be wet or dry, is usually paler than that of *G. pseudoferreum;* it may also be distinguished by its soft fibrous nature and by the presence of small white flecks of mycelium.

GENERAL CONSIDERATIONS

A fact of fundamental importance in the control of the root diseases of rubber is that, unlike those of many other crops, they cannot survive in the soil, but only in infected wood. The sources of infection of young rubber trees are mostly the roots and boles of old rubber or jungle trees that were diseased at the time of clearing. New centres of infection can arise subsequent to clearing, from the colonisation of moribund stumps or surface timber by wind- or insect-borne spores of the pathogens.

The incidence of infection is much affected by the method of clearing. After complete mechanical clearing of rubber trees there is little left in the soil except small sections of root, which decay quickly. Diseased roots, which will be broken up and scattered by the clearing operation, cause some infection which will be concentrated in the early years.

The alternative methods of clearing, by felling and poisoning the stumps or by poisoning the standing trees, both leave substantial root systems in the ground and thus result in root disease infection being at a higher rate and spread over a longer time. Not only is it impossible to completely eradicate all sources of disease before planting, but we doubt whether it is economic even to attempt eradication except where diseased old trees lie near the new planting points.

The greater persistence of the stumps of hardwood jungle species, as compared with rubber stumps, makes it likely that root disease incidence on young rubber in new plantings will continue over a longer period than in replantings. Thus in new plantings it is all the more important to see that root disease is constantly kept under observation and control.

Some of the young trees will become infected and lost, whatever the type of clearing. The most important point to ensure is that root disease does not become established on the young stand, passing from tree to tree to give rise to a 'patch'. Secondly, it should be controlled from the beginning, so that it is not allowed to affect the density and regularity of the final stand. Losses in the first year or so are relatively unimportant as the vacancies can readily be replaced. Some losses during the rest of the period of immaturity can be accepted, provided they are scattered and kept low enough to leave an adequate stand from which to thin selectively. A stand which is not uniform does not make the best use of the land and is more susceptible to wind damage. As thinning progresses the individual tree takes on more importance until,

when the final stand is selected, it can be regarded as having cost a proportional share of the money invested in the area. Any root disease loss suffered thereafter represents a loss of revenue. The aim should be, therefore, to control the disease before this stage is reached.

IMMATURE RUBBER

Detection of Root Disease

New centres of root disease infection should be detected through regular rounds of foliage inspection, commencing not later than twelve months after planting and continuing at intervals not less than every three months, as recommended in the article in *Planters' Bulletin 35*. When a diseased tree is found, its neighbours on either side should be collar inspected and the inspection continued along the row until a disease-free tree is located. The opening should be made deep enough to expose the under sides of the main whorl of lateral roots.

An infected tree that has been treated should be marked for re-examination as a check on the possibility of re-infection having taken place. Further, where an infected tree has been found to be beyond treatment and has been removed, the neighbouring trees on either side, whether healthy or diseased, should be marked for re-examination. Such trees are not only more valuable in that their loss would leave an undesirable gap in the stand, but they are also more vulnerable because there may be infective material near them.

In marking trees, the date of first opening and the identity of the pathogen should both be indicated—the former most conveniently by the month and year, the latter by a colour code. It is recommended that their collars be re-opened for examination after six months, and once again twelve months after the infection was first found. After some time the marks on the trees will indicate increasingly clearly where the active disease is.

Foliage inspection costs very much less than the routine rounds of tree-to-tree collar inspection previously advised and, though the latter procedure does achieve its originally intended purpose of revealing the presence of the parasites at an earlier stage, the former has important practical advantages. In the first place, rhizomorphs that have reached the collar from a distant or weak food base, and will die off without harming the tree, are not discovered by foliage inspection; hence nothing is spent unnecessarily on treating such cases. Second, the wounding of roots that goes with opening up the collar is largely reduced, as is the loosening of the soil, both of which tend to increase the incidence of root disease. Third, the danger of misidentification is avoided. Several fungi produce strands of mycelium which may be confused with the rhizomorphs of *F. lignosus;* there is one harmless species often found on decaying rubber stumps which produces rhizomorphs that are indistinguishable in the field from those of *F. lignosus*, and which has similar

fructifications. Collar inspection, unrelated to the occurrence of above-ground symptoms, can thus easily result in trees being treated for a 'disease' that is not there, and the eradication of 'sources of infection' that are not infective.

Although regular rounds of tree-to-tree collar inspection have been rejected on practical grounds, we recommend that one such round be carried out before thinning commences, as a check that root disease is not getting established on the young trees without symptoms appearing in the foliage. This 'precautionary' round of collar inspection is primarily intended to detect *G. pseudoferreum* and *F. noxius*, which are slower moving than *F. lignosus*. It is suggested that the round should initially be made on a sample basis, taking say every fourth row or contour, extending the inspection only if the situation is found to warrant it. If the additional cases of root disease that are found are mostly isolated and would adequately have been dealt with by foliage inspection, then tree-to-tree collar inspection can be discontinued provided that differences in soil type and topography had been adequately represented in the sample.

Treatment of Diseased Trees

Foliage symptoms on a young tree usually indicate that death is imminent. On older trees foliage symptoms may become apparent on the leaves of one or two branches supplied by a large infected root. Such trees are treatable. However, the usual situation in an immature stand is that the treatable cases are those which have been found by collar inspection of trees adjacent to those found by foliage symptoms.

In *Planters' Bulletin 35* it was suggested that many infected trees would recover with no more assistance than having diseased lateral roots pruned off. We now have experimental evidence of the recovery of trees infected with *F. lignosus* after limited treatment on two sites, one on a well drained lateritic soil and the other on a poorly drained alluvial soil. The epiphytic rhizomorphs and superficial mycelium, when separated from their food base, proved to be harmless; there was no need to scrape them off. We do not have the experimental evidence in relation to *G. pseudoferreum* and *F. noxius*. As the superficial growth of the latter rarely extends more than an inch or two ahead of penetration, there is little difference between pruning off the penetrated portion of an infected root and pruning off the small additional part bearing only the superficial growth. *G. pseudoferreum*, though similar in its habit, sometimes grows superficially for a foot or so without penetration. For the treatment of diseased trees we therefore advise pruning penetrated lateral roots, cutting them ahead of the superficial growth of *F. noxius*, peeling off the superficial growth of *G. pseudoferreum*, but leaving that of *F. lignosus* in place. Penetrated wood in the collar and tap-root should be excised. The cut ends of lateral roots and wounds at the collar should be tarred, as should any

changkol wounds, after applying a tar acid fungicide to all parts that have been exposed.

Disposal of the Sources of Infection

The only economic way of finding the source of infection is to concentrate the digging where the disease is, by tracing it back along the root by which it came, starting from the infected tree. To dig over the ground to a fixed distance around an infected tree is wasteful and causes needless damage to healthy roots.

It is not always necessary to trace out fully the source of infection. In circumstances which favour the rapid decay of timber it is frequently impossible after the first two years to find the source, as this may have disintegrated by the time the symptoms show in the attacked tree. Where creeping legume covers have been established in a replanting, with consequent rapid rotting of dead wood, we advise tracing the infection no further than the edge of the planting row. A diseased stump lying in the planting row should be eradicated, but others can be left to decay unless, by further disease arising from the same source, it is seen to be necessary either to remove them for burning or to isolate them.

If a source to be isolated is a stump lying in the inter-row, we advise cutting out the basal foot or so of all lateral roots, completely digging out those that are infected, but leaving the rest in position. A deep trench should be cut round the bole, but enough taproot left in the ground to keep it erect. If it were to fall against the side of the pit it would no longer be isolated. It is, of course, unnecessary to isolate the bole of the stump if the disease is limited to its lateral roots.

In new plantings from jungle, where hardwood stumps persist for many years, isolation or eradication of all disease sources would appear, from our present knowledge, to be the safest course to follow.

Effect of Covers

Creeping legumes are the preferred cover in an area known to be infected with root disease, bringing about the rapid decay of the remains of the old stand, without being able to transmit the diseases to the rubber by root contact. It is, however, most important to keep creepers away from the young rubber trees; if they are allowed to form a dense mat round the base of the stem, an infection brought in by the covers or having travelled along a lateral root can quickly spread to and kill the bark in this region.

Where bush covers are planted, it must be expected that they will to some extent add to the cost of root disease control. Unlike the creepers, they may have roots big enough to transmit disease by root contact, Our experience with *Flemingia congesta* suggests that the spread of infection can be halted simply by uprooting dead bushes, which can most readily be recognised shortly after slashing when the new growth is forming; at other times a dead bush is concealed.

MATURE RUBBER

The object of the control measures already described is to locate and dispose of the centres of root disease infection during immaturity, so that the selected stand will not be susceptible to losses from this cause. Even so, the possibility that some sources of infection will still remain in the mature stand must be faced. They may have arisen during the course of thinning by spore colonisation of stumps that were imperfectly protected, or they might be due to prolonged survival in infected rubber wood under special circumstances or in jungle hardwoods. Provision should therefore be made for root disease control to continue, for dealing with a small residual incidence.

The principles of control in mature rubber are essentially the same as in the earlier stages, infected trees being treated or removed and the source of infection isolated if it cannot be eradicated. With the tappers having such intimate knowledge of the individual trees, routine rounds of inspection for root disease are no longer necessary. Tappers can indeed sometimes anticipate the death of a diseased tree from a fall in yield.

Treatment should be aimed at halting the spread of infection. The roots of the dead tree must be removed and burned, and the spread of infection traced. Whether the neighbouring trees can be saved depends on the extent of infection found. If the rubber has most of its productive life still ahead, it will almost certainly pay to treat any tree that can be saved. As the plantation becomes older, treatment will become more costly and the time will come when it is preferable to leave the infected trees to their fate, surrounding them with a trench to check further spread of the disease.

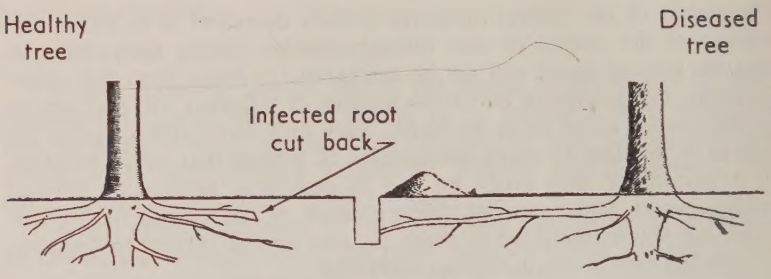
Trenching

An isolation trench should be sited midway between the tree rows, and made deep enough to sever all root connection between diseased and healthy trees; the trench can be as narrow as the trenching tool will allow. The usual dimensions may be taken as one foot wide by two feet deep.

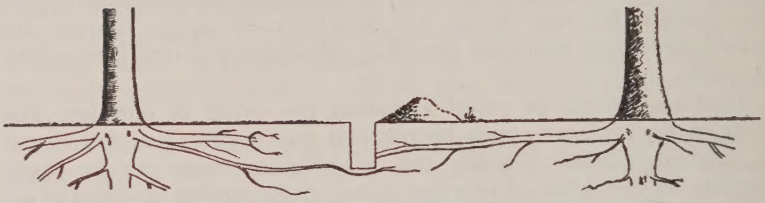
To achieve its purpose a trench must be maintained as an effective barrier for many years. At intervals of eighteen months or so it is necessary to re-cut the trenches, since root contact may re-establish itself in a year or two. This task of re-cutting is made easier if, as soon as they are constructed, the trenches are filled again to about three quarters of their depth. Their position is thus still indicated, and the new roots will grow through the replaced soil. Instead of having to be cut deeper each time, the trench then need be re-opened only to its original depth. Refilling is, however, unnecessary where the trench reaches down to the water table, below which roots will not grow.

The principal difficulty in making isolation trenches is to site them properly. Because it is essential to have no disease outside the trench,

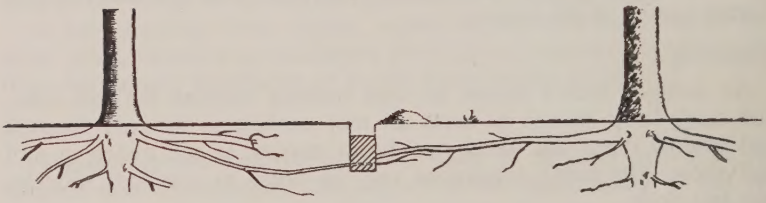
ISOLATION TRENCHING



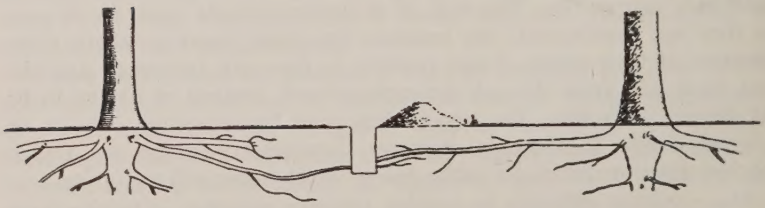
Newly dug trench



Root growing under trench

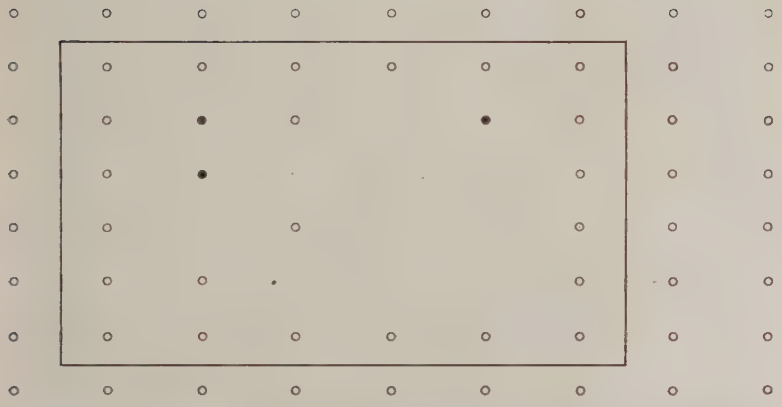


Root growing through half-filled trench

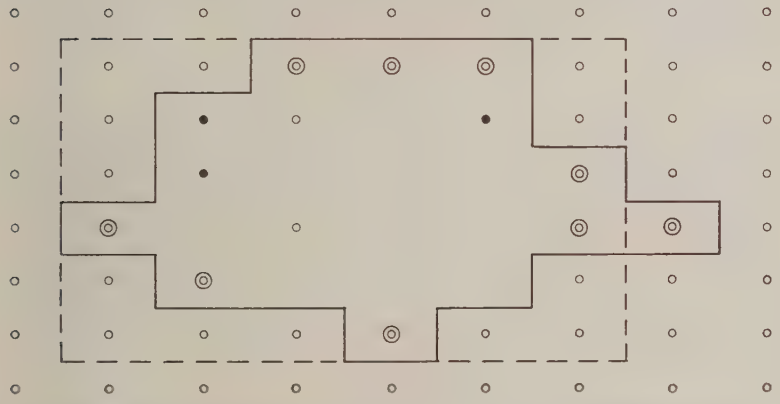


The trench re-dug

ISOLATION TRENCHING



Trenching by rule — many healthy trees included and therefore condemned, the odd diseased tree left outside.



Trenching by inspection — all diseased trees included, and a minimum number of healthy trees.

- ○ Standing tree.
- ● Tree visibly dying from root disease.
- ◎ Tree found diseased by collar inspection.

there is a temptation to site it well back from where active disease is seen, leaving many healthy trees inside the trench to become infected and killed unnecessarily. On the other hand, placing the trench close outside the limit of advance of the disease entails an impossible amount of digging to discover the location of the disease. The procedure recommended is to inspect the collars of trees around an infected patch, and to site the trench between those found healthy and those found diseased. Every section of root taken out of the trench must be examined as there is a likelihood that some will be found to be diseased. The alternatives then are either to trace out and remove all diseased roots on the outside of the trench at this point, or to resite the trench further out. It may be found an economy to open portions of the projected trench first, resiting them further out if necessary, then joining up the sections finally chosen.

To make and maintain a properly sited isolation trench in mature rubber is an expensive undertaking. It should be looked upon not as part of the normal procedure of root disease control, but as an emergency measure to be resorted to where control has not been achieved.

Root disease patches in neglected rubber will extend indefinitely. In these circumstances the cost of isolation steadily increases, while the yield potential of the area progressively falls. There comes a time, therefore, when it is no longer economic to attempt isolation of disease patches; the disease can only be left to run its course until the area is replanted.

LABOUR

An efficient estate maintains a regular 'pest and disease' gang, under an experienced mandore. Through being permanently employed on this work the gang will acquire an intimate knowledge of the diseases and their distribution over the estate. Experience of this sort is invaluable, making possible the prompt detection of disease symptoms and avoiding needless work in the execution of control measures. It is our policy to make our Field Assistants available to train root disease gangs on the estate. We believe it is in an estate's interest to employ able bodied men on this work, and to appoint a capable man to take charge of them.

CONCLUSION

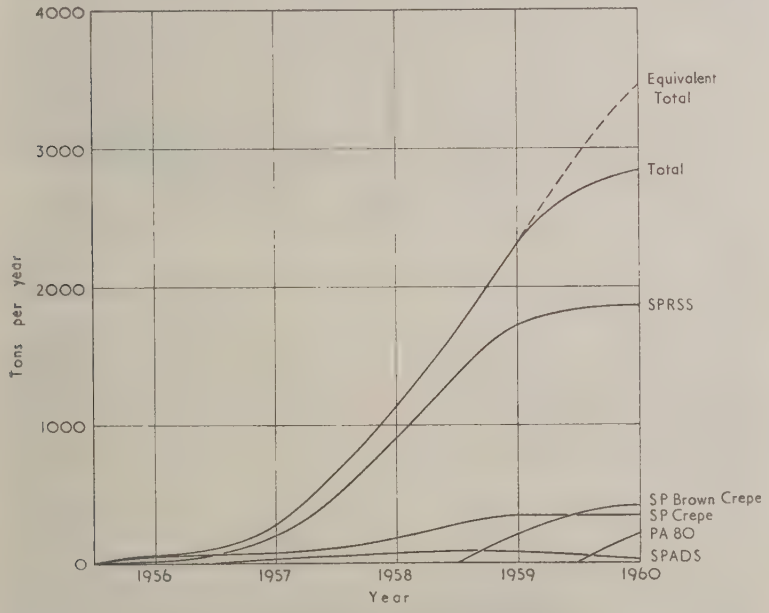
Because in many situations the control procedures which we advise entail leaving infective material to decay in the ground, it is all the more important to avoid encouraging in any way the spread of the root diseases. All root wounds should be treated with a fungicide, and tarred. Cover plants and weeds should be kept away from the collars of young trees. The ultimate aim of root disease control measures is to have a plantation that is effectively free from root disease. Such a situation is not unattainable — it did exist in plantations of rubber following the cultivation of sugarcane on the same site. It is, however, an essential

corollary of root disease treatment that no opportunity is given to the root diseases to start new centres of infection. Any rubber stump that is left in the ground — following thinning, felling for firewood, disease attack or storm damage — must be poisoned (following the methods given in *Planters' Bulletin 47*) and the cut surface treated with creosote. That the need for these precautions went unrecognised for so many years may be suspected as the underlying cause of the root disease problem being of such magnitude.

SP Rubber During 1960

THE AMOUNT OF SP RUBBERS SHIPPED from Malaya continued to increase in 1960, reaching a total of 2,828 tons for the year. The diagram below illustrates the amounts shipped since the beginning of commercial production of SP rubbers in 1956.

As PA 80 is a concentrated form of SP rubber, the user mixes one ton of PA 80 with three tons of ordinary rubber to give four tons of SP rubber equal in extrusion characteristics to the standard SP rubbers. The dotted line showing equivalent SP rubber allows for this hidden usage of SP rubbers, and suggests that interest in these rubbers has continued to increase in 1960 at the same rate as in 1959. The introduction of PA 80 has resulted in a rearrangement of the kinds used:



Yearly shipments of SP rubbers.

TABLE 1

Type	*Shipments (tons) 1959*	*Production (tons) 1960*	*Shipments (tons) 1960*	*Peak monthly shipments (tons)*
SP RSS	1720	1863	1853	238 March
SP crepe	328	320	330	54 April
SP ADS	60	21	20	5 June
SP brown crepe	208	429	415	76 December
PA 80	0	249	210	35 August
Total	2316	2882	2828	287 June

PA 80 has in some cases replaced SP RSS and SP crepe so that usage of the former types has not increased so spectacularly in 1960.

The amount of each grade produced and shipped during 1960 is given in *Table 1*, together with the corresponding shipment figures for 1959, and the peak monthly shipments during 1960.

Production is in accordance with demand, but it is evident from the peak shipment figures that present production capacity is capable of handling almost twice the amount actually shipped in 1960.

SP RSS. Shipments increased a little over the previous year, but after the record 600 tons in the first quarter of the year it declined in each subsequent quarter. Ten estates were at one period producing SP RSS, the newcomers during the year being Chemor United and Tanjong Rambutan Estates. The R.R.I. Experiment Station took up production again of SP RSS from January to April, shipping 41 tons, while commercial production capacity was being increased.

SP Crepe. Despite a heavy decline in the last quarter, shipments were very close to the 1959 figures. Supplies were maintained by three estates.

SP ADS. Demand for this was small and one estate has supplied the orders.

SP Brown Crepe. Shipments doubled in 1960, and six estates were making this grade at the end of the year. Ban Hin, Glugor, Senawang and Ulu Tiram Estates each took up production during the year. In order to boost supplies, the R.R.I. Experiment Station restarted production late in September and had shipped $16\frac{1}{2}$ tons by the end of the year.

PA 80. Production of PA 80 began at the R.R.I. Experiment Station in January and has continued there throughout the year. In June, H & C Latex and Ulu Tiram Estate began commercial production, followed later by Glugor, Senawang and Sungei Wangi Estates, so that by the end of the year six commercial producers were making

PA 80. Shipments of 210 tons during the year is an excellent start, suggesting that its use is firmly established. PA 80 has to some extent replaced SP RSS and SP crepe, but it has also found new fields of use for SP rubbers such as conferring SP characteristics on synthetic rubbers.

Shipments of SP rubbers during 1960 were made to twenty-three consumer countries as shown in *Table 2*.

A decrease in shipments to four countries—Germany, New Zealand, Great Britain and Italy—was recorded, the largest being 150 tons less to Germany. All other countries took greater amounts of SP rubbers than in the previous year, the most important increases being to France, Japan, U.S.A. and Malaya.

There is considerable consumer resistance to purchasing a product like SP rubber which requires a premium; this is especially marked when the price of natural rubber is above that of general purpose synthetic. One of the tasks of our colleagues giving technical service to rubber users is to bring to their attention the value of SP rubbers in manufacturing processes and to suggest how they can be used profitably. It is vitally important to have SP rubber promptly available if the manufacturers' initial interest is to be sustained. We try, with our limited output, to maintain small stocks ready for prompt despatch anywhere in the world; but the position would be improved if producers carried larger stocks and users placed regular forward orders.

Now that the price of natural has reached a level where it is economically competitive with synthetic we believe that improved rubbers like SP rubber have a much better chance of acceptance.

TABLE 2. SHIPMENTS OF SP RUBBERS IN 1960 COMPARED WITH 1959 (TONS)

	SP RSS 1960	*SP crepe 1960*	*SP ADS 1960*	*SP brown crepe 1960*	*PA 80 1960*	*Total 1960*	*Total 1959*
Great Britain	222.5	171.1	—	126.5	20	540.1	574.6
U.S.A.	436.2	—	—	1	50.8	488	356.8
Japan	204.1	38	—	100.9	9.5	352.5	209.9
New Zealand	238	7	—	—	44	289	347
France	154	18	15	45	18	250	72
Australia	171.7	14	4	6.1	40	235.8	224.9
Germany	191	5	—	0.5	3.5	200	349.9
Malaya	0.4	—	1.1	111.1	1.2	113.8	10
South Africa	75	10	—	24	0.5	109.5	50
Italy	54.2	—	—	—	0.1	54.3	64.5
Belgium	30	—	—	—	10	40	35.5
Spain	—	40	—	—	—	40	0
Sweden	31	5	—	—	0.5	36.5	15
Netherlands	30.1	1	—	—	0.5	31.6	0
Finland	—	20	—	—	—	20	0

Argentina, Turkey, Greece, Canada, Denmark, Portuguese East Africa, Portugal and Norway have received amounts of under ten tons.

The premium for SP rubbers originally suggested by the R.R.I. of Malaya has in general been maintained. Under present marketing conditions with more direct competition from synthetic polymers, raising this premium is a certain method of lessening demand and possibly irreparably damaging the greater acceptance of newer types of natural rubber. There is room for much more SP rubber to be used. SP rubber supplies New Zealand with almost 5% of her total natural rubber requirements. Other rubber consuming countries may well follow New Zealand's example; requirements would then multiply tenfold.

Fasciation. A Harmless Deformity of Rubber

FASCIATION is a condition in which a stem develops into a band, which may be much curved and divided, instead of into its normal form. The Latin root, referring to a ribbon-like band, is familiar in the word 'fascia'. The abnormality arises from the terminal bud giving rise to a line of growing points, each producing aborted leaves on abnormal shoots. Grooves on the outside of the mass, and the positions of leaves, distinguish the individual stems (*Figure 1*). As the failure of the 'stems' to separate can be initiated only in the earliest stages of development, the cause must be sought in the bud initial itself.

If it were found that all buddings, or a certain proportion of seedlings, from an affected plant were always fasciated, a genetic factor interfering with the growth of shoots would be postulated. Such an effect does occur with certain plants, notably *Celosia*, the fasciated form of which (*C. cristata*, Cockscomb) is as familiar in Malayan gardens as the non-fasciated forms of *Celosia*.

Figure 1. Early stage of fasciation showing the terminal shoot banded and split into three.

A genetically determined susceptibility to fasciation can occur in *Hevea*. The mother tree of AVROS 164, growing in Sumatra, developed fasciations for several years running, and seedling progeny of this clone in Indonesia and Vietnam had a high proportion of fasciated stems.

Figure 2. Late stage of fasciation with normal shoot emerging from apex of distorted woody mass.

Fasciated branches have been found in Malaya on *Hevea* seedlings a few months old, in budwood nurseries, and on mature trees. They have always been sporadic and they have never been found to persist after cutting back. If left alone the fasciated branch becomes woody (*Figure 2*), normal branches overtake it in growth, and it drops off. The condition is therefore an abnormality—like a bent branch or a kinked stem—not a disease.

There must be some agent that disorganises the terminal growing point causing it to divide into a number of other terminal growing points, instead of forming a normal shoot. It could be a toxin injected into the cells by sucking insects. The adult and crawler stages of mealy bugs are commonly found on fasciated stems, particularly *Planococcus citri*. Bending of the stem, a malformation somewhat comparable with the early stages of fasciation, has been induced on young rubber seedlings by growing colonies of *P. citri* on their shoots.

A higher-than-normal proportion of fasciated stems developed from the scar of pruned-off lateral shoots in a budwood nursery in the R.R.I.M. compound, suggesting that fasciation may be induced by mechanical injury alone.

Whatever the cause or causes of fasciation, it is striking but not a serious matter. If affected branches are pruned off, they will be replaced by normal shoots. We have never received reports of more than the odd plant being affected amongst many thousands of normal ones.

TCR in Indonesia

THE RUBBER RESEARCH INSTITUTE OF MALAYA acts as co-ordinator for technical matters concerned with the Technically Classified Rubber Scheme under the auspices of the International Rubber Research and Development Board, and in this capacity the R.R.I.M. was requested to arrange a visit to Indonesia for the purpose of obtaining first-hand information on and suggesting possible improvements in the production and shipment of TC Rubber. The officer-in-charge of TC Rubber at the R.R.I.M. spent ten days in Bogor towards the end of 1960.

where he had discussions with officers closely connected with TCR in Indonesia, and visited four estates producing TCR and the two laboratories at Balai Penjelidikan Perkebunan Besar (B.P.P.B., formerly C.P.V.) and at Balai Penjelidikan dan Pemakaian Karet (B.P. & P.K.).

In Indonesia there are three test stations equipped for technical classification, two in Bogor, at B.P.P.B. and at B.P. & P.K., and one in Medan at the Research Institute of the Sumatra Planters' Association (R.I.S.P.A., formerly A.V.R.O.S.). The last named, which used to classify about 1,000 tons per annum from a few large estates in Sumatra, ceased functioning in 1957. The only active station at present is the one at B.P.P.B. but this is working well below its capacity.

The following summarises the main impressions gained during the visit. The B.P.P.B. is entirely responsible for the technical classification of the production of estates in Java. These can be divided by ownership into four classes:

1. Estates now under Pusat Perkebunan Negara, P.P.N. Lama (formerly state-owned).
2. Estates now under P.P.N. Bahru (formerly Dutch privately-owned) comprising the large majority of estates.
3. Foreign company estates, non-Dutch, and mostly British.
4. Privately-owned Indonesian estates.

The first two groups are shortly to be amalgamated into one government body. Most of the TC estates were from the second and third groups.

The production of TCR in Indonesia has been steadily decreasing since 1955. Statistics indicate that the output in 1959 was only 54% of that in 1955. Also, the proportion of Red Circle rubber has been increasing over these years and that of Yellow Circle rubber has become less.

At the time of the visit few estates were sending production samples for test. Even those doing so submitted samples at irregular intervals. No new estates have entered the scheme since 1953 when there was a maximum of approximately 130 estates.

Level changing methods were not being employed or requested by estates and blending techniques to reduce variability were rarely used. The increasingly high proportion of Red Circle rubber was said to be due to the withdrawal from the TC scheme of estates in East Java which generally produced Blue or Yellow Circle rubber. With only the estates in West Java participating, a maximum TCR potential of about 35,000 tons per annum is indicated.

Estate procedures were generally similar to those in Malaya. As in this country, a small shift towards higher strain values during wintering has been noted in the TC test results. Otherwise there were no marked seasonal variations.

Only about 5% of the rubber in Java comes from smallholders and

and this is looked after by B.P. & P.K. As there are no large packing houses producing TCR B.P. & P.K. had little interest in technical classification. It was suggested that blending with a view to classification could, however, be undertaken initially at one of these packing houses or at a collective smoking depot. B.P. & P.K. is well equipped especially for the pilot scale manufacture of vulcanised rubber goods.

The present low production of TCR in Indoniesia is attributable to the early failure of producers to obtain a premium for their classified rubber and their consequent lack of interest, labour problems, financial control measures curtailing estate expenditure and difficulties associated with providing an adequate advisory service dealing with rubber processing. Since about 75% of the estates in Java will shortly come under a single state controlled body, the future of TCR in Indonesia could well be improved.

Although interest in Technical Classification was very small, there was no active opposition to it. Local interest in TCR could therefore be revived and result in increased activity in the coming years. The suggestions made during the visit could help this revival.

Correspondence: Girth Increment of Clone RRIM 501 on Alternate Daily Periodic Tapping

I have now available some fairly indicative figures for the girthing of the above clone on alternate daily tapping, six months out of nine (S/2.d/2.6m/9.67%).

This periodic tapping system was introduced in April 1960. The experimental area is sub-divided into three blocks of 4 acres each, two in tapping and one resting.

The girth measurements of 100 tapped trees in each block have been taken at 60 inches from the union every three months. Girth increment figures are summarised in the table.

	Block A	*Block B*	*Block C*
	(inches)	(inches)	(inches)
1st quarter (April-June)	tapped + 0.20	tapped + 0.45	rested + 0.81
2nd quarter (July-Sept.)	rested + 0.98	tapped + 0.48	tapped + 0.11
3rd quarter (Oct.-Dec.)	tapped + 0.55	rested + 1.44	tapped + 0.45

Our average girth increment for the year 1958/59 on S/2.d/3.67% tapping was 0.41 inches, but the indications are that we should be well up to 2 inches during the first year of periodic tapping.

P.D. Rooth
Manager
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This is an extremely interesting observation which if confirmed in further experiments may prove a major contribution to solving the problem of trunk snap of clone RRIM 501. Poor girthing under normal continuous tapping is probably the most important factor in disposing these trees to wind damage (see Planters' Bulletin 43). *Experiments carried out on high yielding planting material have shown that the rate of girthing does not differ appreciably for either alternate daily or for third daily tapping of a half spiral cut.*

Periodic tapping systems were closely investigated in a series of experiments carried out by the R.R.I.M. before the war. The detailed records were lost during the war, but some results of these experiments can be found in our Annual Reports *of* 1939 *and* 1940 *and in* Planters' Bulletin 1 (1952). *The latter reference deals with the yield aspect only, and shows that the yield level of trees tapped S/2.d/2.6m/9.67% is very similar to that obtained on continuous S/2.d/3.67% tapping.*

The tables in the Annual Reports *include information on girth increment. It is shown that nearly all clones responded with improved girth increment when tapping intensity was reduced from S/2.d/2.100% to S/2.d/2.6m/9.67%. There were, however, large clonal differences. The best response was recorded for clone AVROS 49 which girthed 52% better during the first three years of periodic 67% intensity tapping than buddings of the same clones tapped S/2.d/2.100%. However, the loss in crop was 26%.*

We have now started an experiment on clone RRIM 501, in which we compare the following treatments:

1. *No tapping.*
2. *Continuous alternate daily tapping (S/2.d/2.100%).*
3. *Periodic alternate daily tapping for eight months out of twelve (S/2.d/2.8m/12.67%).*
4. *Periodic alternate daily tapping for nine months out of twelve (S/2.d/2.9m/12.75%).*

This is a small scale experiment as we have no large monoclone blocks at our Experiment Station.

We would welcome an offer of a tappable (20 in.) monoclone area of clone RRIM 501, as yet unopened, to follow up this most interesting subject—Editor.

R.R.I.M. Lecture Course

The Rubber Research Institute of Malaya is organising a course of lectures to be held at the Institute from Monday, 29 May to Friday, 2 June 1961, for estate assistants. Those attending the course are expected to have a sound basic idea of estate management and practice. It is not intended to teach basic practical work.

The lectures will be given by members of the Institute staff and will cover planting material and tapping; pests and diseases; soils; fertilisers; covers and weed control; sheet, crepe and concentrate manufacture; and new rubbers. There will also be a field trip to the R.R.I. Experiment Station at Sungei Buloh.

No fee will be charged for the course but those attending will be responsible for making their own arrangements for meals and accommodation. A small charge may be made to provide transport to the Experiment Station for the field trip.

Attendance at the course will be limited and early application should be made to the Director, R.R.I.M., P.O. Box 150, Kuala Lumpur.

OUR COVER PHOTOGRAPH SHOWS AN AERIAL VIEW OF R.R.I. HEADQUARTERS.

Photo P.R.W.

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